IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appellant:	Nemeth
Filing Date:	January 26, 2001
For:	PHOTO ABLATION TO RESOLVE "BRIGHT ON" PIXEL DEFECTS IN A NORMALLY WHITE LCD
Group Art Unit:	2871
Docket No.:	99CR065/KE
Application No.:	09/770,854
Examiner:	T. Chowdhury

BRIEF ON APPEAL

Mail Stop AF
Commissioner for Patents
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Alexandria, VA 22313-1450

REAL PARTY IN INTEREST

This application is assigned to Rockwell Collins, Inc. having a place of business at 400 Collins Rd. NE, Cedar Rapid, Iowa 52498.

RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

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STATUS OF THE CLAIMS

All claims (1-20) stand rejected.

STATUS OF THE AMENDMENTS

The claims have not been amended subsequent to the receipt of a final Office Action mailed June 25, 2003.

SUMMARY OF THE INVENTION

The present invention relates to a method of and/or an apparatus for repairing defects in a normally white liquid crystal display. The defects are associated with pixels of the display. A defective pixel is typically electrically open and allows light to constantly pass through it on a normally white liquid crystal display. The defective pixel appears white or grey and is often referred to as an electrically open or a "bright on" pixel defect. See present application, page 5, lines 26-33.

Each of Independent Claims 1, 8 and 12 recites the ablation of a portion of a color filter to mask the "bright on" pixel defect. The ablation discolors the pixel at the location of the defective pixel so that it has a darker appearance than the white or gray appearance of a "bright on" pixel defect. The present application describes the use of a laser to provide ablation as follows:

> A laser . . . permits the ablation of the pigmented color filter material coated or adhered to a glass substrate of the LCD without causing thermal or mechanical damage to the glass substrate. The laser is used to darken the defective pixel by focusing on a color filter of the defective pixel. After a portion of the color filter is darkened, a minor defect exists instead of a major defect.

See present application, page 3, lines 3-12. Such a technique provides significant advantages and meets long felt needs associated with the repairing of liquid crystal displays. "The ablation is achieved by creating minimal damage to the color filter and no damage to the glass substrate 124." See present application, page 8, lines 33-35.

The filter is discolored to a dark color so that the "bright on" pixel defect is less noticeable. In one embodiment, a system 100 includes an ablation system 110 and an LCD 160. LCD 160 includes a color filter glass substrate 124, a color filter 122, a plurality of pixels, and a

thin film transistor glass substrate 134. A defective pixel 126A can be modified by applying laser energy to color filter 122 until it is discolored to an acceptable level. When the method and apparatus is utilized with a color display including red, green and blue pixels, the level of darkening or discoloration can be set for the particular type of pixel. "In general, red pixels and green pixels that are defective usually need discoloration more than defective blue pixels. Defective blue pixels may not need any discoloration due to their limited adverse impact on viewers." See present application, page 6, lines 21-25.

Independent Claim 1, the representative claim of the first group is directed to a method for repairing defects in a normally white liquid crystal display. The method includes at least partially ablating the portion of the color filter corresponding to the defective pixel using a laser to discolor the color filter without damaging the glass substrate associated with the color filter.

Independent Claim 8, the representative claim of the second group, is directed to an apparatus for repairing defects in a normally white liquid crystal display. The apparatus includes a controller adapted to control the laser to ablate a portion of the color filter, wherein the color filter is discolored at the location of each defective pixel.

Independent Claim 12, the representative claim for the third group, is directed an apparatus for repairing defects in a normally white liquid crystal display including ablation means for discoloring the color filter.

Dependent Claim 6, the representative claim in the fourth group, is dependent upon Claim 1 and further directed to a method wherein the step of ablating further comprises darkening a portion of the color filter according to an original color of the defective pixel.

Dependent Claim 15, the representative claim of the fifth group, is dependent upon Claim 12 and further recites that the ablation means darkens the portion of the color filter corresponding to the color type of the defective pixel.

Dependent Claim 16, the representative claim of the sixth group, is dependent upon Claim 12 and recites that the ablation means only discolors a filter substrate side of the color filter.

ISSUES

Whether the Claims of groups 1-6 can be properly rejected under 35 U.S.C. § 103 over U.S. Patent No. 5,142,386 (Ishihara).

GROUPING OF THE CLAIMS

For the purpose of this appeal only, the grouping under Claims is as follows:

1. Claims 1-5 and 7 essentially stand or fall together and are therefore grouped together. Independent Claim 1 is the representative claim for the group because it is the broadest claim in the group.

2. Claims 8-11 essentially stand or fall together and are therefore grouped together. Independent Claim 8 is the representative claim for the group because it is the broadest claim in the group. Claims 8-11 are grouped together, but separately from group 1, because Claims 8-11 are directed to an apparatus for repairing defects in a normally white liquid crystal display (LCD).

3. Claims 12-14, 17 and 19-20 essentially stand or fall together and are therefore grouped together. Independent Claim 12 is a representative claim for the group because it is the broadest claim in the group. Claims 12-15, 17 and 19-20 are grouped together, but separately from groups 1 and 2, because Claims 12-15, 17 and 19-20 are directed towards an apparatus drafted in means plus function format.

4. Claim 6 essentially stands or falls by itself and is grouped by itself. Claim 6 is dependent upon 1. Claim 6 is grouped separately from group 1 because it recites that the step of ablating further comprises darkening the portion of the color filter corresponding to the defective pixel, wherein the level of discoloration is set according to an original color of the defective pixel.

5. Claim 15 essentially stands or falls by itself and is grouped by itself. Claim 15 is dependent upon Claim 12 and grouped separately from group 2 because it recites that the ablation means discolors the color filter at a different level for the color type of the defective pixel.

6. Claims 16 and 18 essentially stands or falls and are therefore grouped by itself. Claim 16 is dependent on claim 12. Claims 16 and 18 are together grouped separately

from group 3 because it recites that the ablation means only discolors a filter substrate side of the color filter.

ARGUMENT

REFERENCES RELIED UPON

The following reference was relied upon by the Examiner: U.S. Patent No. 5,142,386 (Ishihara).

BRIEF DESCRIPTION OF THE REFERENCE

U.S. Patent No. 5,142,386 (Ishihara)

Ishihara provides a defective pixel compensating method for an active matrix display. Ishihara, col. 1, lines 10-16. "A laser beam 34 irradiates the defective pixel so that the color filter 30 is burned and blackened. In addition, the rubbed surface of the individual transparent electrode is heated by the radiated laser beam 34 and therefore, disturbed by heat, so that the molecular orientation of the liquid crystal in contact with the disturbed rough surface of the individual transparent electrode 22 is also disturbed." See Ishihara, col. 4, lines 53-65. The energy of irradiation is controlled so that the defective pixel provides a fixed gray level which is a mid-point tone between white and black. See Ishihara col. 5, lines 28-42.

BACKGROUND

All claim rejections at issue in this appeal are made under 35 U.S.C. § 103(a)[1] The legal standards under 35 U.S.C. § 103(a) are well-settled.

Obviousness under 35 U.S.C. § 103(a) is a legal conclusion involving four factual inquiries:

(1) the scope and content of the prior art;

(2) the differences between the claims and the prior art;

(3) the level of ordinary skill in the pertinent art; and

(4) secondary considerations, if any, of non-obviousness.

[1] "A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made." 35 U.S.C. §103(a).

Litton Systems, Inc. v. Honeywell, Inc., 87 F. 3d 1559, 1567, 39 U.S.P.Q. 2d 1321, 1325 (Fed. Cir. 196). See also Graham v. John Deere Co., 383 U.S. 1, 148 U.S.P.Q. 459 (1966).

In proceedings before the Patent and Trademark Office (PTO), the Examiner bears the burden of establishing a prima facie case of obviousness based upon the prior art. In re Piasecki, 745 F.2d 1468, 1471-72, 223 U.S.P.Q. 785, 787-88 (Fed. Cir. 1984). A prima facie case of obviousness requires that the prior art reference or references teaches or suggests all of the claimed limitations. In re Royka, 490 F.2d 981, 180 U.S.P.Q. 580 (CCPA 1974); Manual of Patent Examining Procedure (MPEP), Edition 8(e8), August 2001, Sections 2142, 2143.03. "The Examiner can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references. In re Fritch, 972 F.2d 1260 (Fed. Cir. 1992); In re Fine, 837 F.2d 1071, 1074 (Fed. Cir. 1988); In re Lalu, 747 F.2d 703,705, 223 U.S.P.Q. 1257, 1258 (Fed. Cir. 1984); Ashland Oil, Inc. v. Delta Resins & Refractories, Inc., 776 F.2d 281, 297 n.24, 227 U.S.P.Q. 657, 667 n.24 (Fed. Cir. 1985); ACS Hospital Systems, Inc. v. Montefiore Hospital, 782 F.2d 1572, 1577, 221 U.S.P.Q. 929, 933 (Fed. Cir. 1984). When a reference teaches away from the claimed invention, that teaching is strong evidence of non-obviousness. See U.S. v. Adams, 383 U.S. 39, 148 U.S.P.Q. 79 (1966); In re Royka, 490 F. 2d 981, 180 U.S.P.Q. 580 (CCPA 1974).

Since virtually all inventions are combinations of old elements, examiners may often find every element of a claimed invention in the prior art. In re Rouffett, 149 F.3d 1350, 1357, 48 U.S.P.Q.2d 1453, 1456 (Fed. Cir. 1998). However, rejecting patents solely by finding prior art corollaries for each claim element would permit an examiner to use the claimed invention as a blueprint for piecing together elements in the prior art to defeat the patentability of the claimed invention. Id. If simply identifying each claimed element in the prior art were enough to negate patentability, very few patents would even issue. Id. The best defense against this subtle but powerful attraction of a hindsight-based obviousness analysis is a rigorous application of the requirement for a showing of the teaching or motivation to combine references. In re Dembiczak, 175 F.3d 994, 999, 50 U.S.P.Q.2d 1614, 1617 (Fed. Cir. 1999). Broad, conclusory statements regarding the teachings of multiple references, standing alone, are not evidence of obviousness. Id.

REJECTIONS

1. The claims of Group 1-6 are patentable under 35 U.S.C. §103(a) over Ishihara because Ishihara does not teach or suggest discoloring the color filter.

Ishihara does not disclose or suggest discoloring the color filter. Rather, Ishihara discloses burning and blackening of the color filter and the destruction of the liquid crystal cell to cause the pixel to have a grey color. See Ishihara, col. 4, lines 56-64. Ishihara specifically states that "the defective pixel has a mid-point tone between white and black." See Ishihara, col. 5, lines 1-5. Further, Ishihara states:

> The necessary energy amount [is] determined . . . so that the defective pixel will give a fixed grey level which is a mid-point tone between white and black.

See Ishihara, col. 5, lines 35-42. Therefore, Ishihara teaches the use of a brute force ablation technique which burns the color filter and destroys the liquid crystal cell to cause the pixel to have a grey color.

Applicants note that the term "discolor" as understood by one of ordinary skill in the art is different than the term "blackened" as used by Ishihara. The present invention as recited in the claims of groups 1-3 utilizes discoloration to fix "bright on" defects which are white or grey in color. Clearly, discoloration as that term is used in the present application refers to a darkening beyond grey. The defective pixel in the claims of groups 1-6 is discolored to a darker color than the fixed grey level of Ishihara. Ishihara does not provide a suggestion for discoloration as that term is used in the present application.

As mentioned above, a prima facie case of obviousness requires that the prior art reference or references teaches or suggests all of the claimed limitations. See In re Royka, 490 F.2d 981, 180 U.S.P.Q. 580 (CCPA 1974); MPEP, Edition 8(e8), August 2001, Sections 2142, 2143.03. Accordingly, the claims of groups 1-6 are patentable over Ishihara which does not teach or suggest the limitation of discoloring the defective pixel.

2. The claims of groups 1 and 4 are patentable under 35 U.S.C. § 103(a) over Ishihara because Ishihara does not suggest discoloring the color filter without damaging a glass substrate and in fact teaches away from such a technique.

Ishihara does not suggest a process that does not damage glass substrates. Ishihara states:

> [A] laser beam 34 is radiated to the defective pixel as shown in Figure 3, so that the color filter is burned and blackened. In addition, the rubbed surface of the individual transparent electrode 22 is heated by the irradiated laser beam and therefore, disturbed by heat, so that the molecular orientation of the liquid crystal in contact with the disturbed rubbed surface of the individual transparent electrode 22 is also disturbed.

See Ishihara, col. 4, lines 53-55 (emphasis added). As shown in Ishihara, the laser is provided through substrates 26 and filter 30 to reach electrode 22. See Ishihara, Figure 3.

Applicants note that the brute force technique of Ishihara clearly teaches the destruction of both the liquid crystal cell and the color filter, thereby more likely resulting in damage to the substrate. Although the following quote upon initial read appears to indicate that Ishihara teaches the blackening of the color filter or the disturbance of the molecular rotation of the liquid crystal cell, Ishihara clearly teaches both blackening of the color filter and disturbing the molecular orientation of liquid crystal cell. Ishihara states:

> With the blackening of the color filter 30 and/or the disturbance of the molecular orientation of the liquid crystal will cause the defective filter to have a grey color, preferably a mid-point between white and black.

See Ishihara, col. 5, lines 1-5. However, this statement clearly relates to what causes the mid-point tone, not a process which either blackens the color filter or disturbs the molecular orientation. Therefore, Ishihara cannot be read to suggest a method or system which only discolors the color filter. Accordingly, Ishihara does not suggest a method that is designed to prevent substrate damage.

As mentioned above, a prima facie case of obviousness requires that the prior art reference or references teaches or suggests all of the claimed limitations. See In re Royka, 490 F.2d 981, 180 U.S.P.Q. 580 (CCPA 1974); MPEP, Edition 8(e8), August 2001, Sections 2142, 2143.03. Accordingly, the claims of group 1 and 4 are patentable over Ishihara which does not teach or suggest the limitation of discoloring the defective pixel without damaging the substrate.

Applicants note that Ishihara in fact teaches away from the present invention by providing laser 34 that disturbs the molecular orientation of electrode 22 on the substrate 24 (the substrate on the opposite side of the color filter substrate 28). The explicit teaching for the disturbance of the molecular orientation of the liquid crystal makes it clear that substrate damage likely occurs in direct contrast to the explicit limitation in the claims of groups 1 and 4. Therefore, Ishihara teaches away from the claims of groups 1 and 4.

As discussed above, teaching away from the claimed invention is strong evidence of non-obviousness. See U.S. v. Adams, 383 U.S. 39, 148 U.S.P.Q. 79 (1966); In re Royka, 490 F. 2d 981, 180 U.S.P.Q. 580 (CCPA 1974). Accordingly, the claims of group 1 are patentable over Ishihara which teaches away from the invention as recited in the claims of group 1.

3. The claim of group 4 is patentable under 35 U.S.C. § 103 over Ishihara because Ishihara does not teach or suggest that the step of ablating further comprises darkening the portion of the color filter corresponding to the defective pixel, wherein the level of discoloration is set according to an original color of the defective pixel.

As discussed above, Ishihara describes the modification of the defective pixel so that it is grey. Only one level of darkening, darkening to a mid-point of color of grey is described or suggested. Clearly, discoloration in accordance with the original pixel color is not shown, described or suggested.

In the final Office Action, the Examiner states "[a]s to the limitation of citing the level of discoloration in accordance with the original color of the pixel, since it is common and known in the art that blue color requires much less intensity than green and red colors and thus would avail a proven technique." See final Office Action page 3, lines 5-8. However, the Examiner has provided no indication for a suggestion or motivation to modify Ishihara. In fact, the quote appears to be taken directly from Applicant's disclosure. Ishihara clearly only describes the use of one masking color, a fixed grey level, without regard to original pixel color. Indeed, Ishihara is not even aware of the problem caused by defective pixels of different original colors. Accordingly, the Examiner is engaging in improper hindsight reasoning.

As mentioned above, a prima facie case of obviousness requires that the prior art reference or references teaches or suggests all of the claimed limitations. See In re Royka, 490

F.2d 981, 180 U.S.P.Q. 580 (CCPA 1974); MPEP, Edition 8(e8), August 2001, Sections 2142, 2143.03. Accordingly, the claim of group 4 is patentable over Ishihara which does not teach or suggest the limitation of discoloring in accordance with the original pixel color.

4. Claim 15 of group 5 is patentable under 35 U.S.C. § 103 over Ishihara because Ishihara does not teach or suggest ablation means that discolors the filter at a different level for the color type of the defective pixel.

As discussed above, Ishihara does not provide any suggestion for discoloring the color filter at different levels. Claim 15 explicitly recites that the ablation means discolors the filter at a different level for the color type. As discussed above, Ishihara only discloses one color of masking (a fixed grey level).

As mentioned above, a prima facie case of obviousness requires that the prior art reference or references teaches or suggests all of the claimed limitations. See In re Royka, 490 F.2d 981, 180 U.S.P.Q. 580 (CCPA 1974); MPEP, Edition 8(e8), August 2001, Sections 2142, 2143.03. Accordingly, the claim of group 5 is patentable over Ishihara which does not teach or suggest the limitation of discoloring at a different level for the color type of the defective pixel.

5. Claims 16 and 18 of group 6 are patentable under 35 U.S.C. § 103 over Ishihara because Ishihara does not teach or suggest ablation means that only discolors a filter substrate side of the color filter.

Claim 16 recites that the ablation means only discolors a filter substrate side of the color filter. The present application states:

> In some applications, only the side of color filter 122 proximate the color filter substrate 124, or the substrate side of color filter 122 is darkened.

See present application, page 8, lines 31-32.

In the final Office Action, the Examiner states "further, Ishihara discloses about discoloring the filter substrate side of the color filter." See final Office Action page 3. However, the Examiner does not provide a quotation or any indication as to how it discloses such discoloration. Applicants note that Claim 16 explicitly recites discoloring only the filter substrate side of the color filter. Although ablating filter 14 is mentioned in Ishihara, there is no discussion or suggesting to ablate only one side of filter 14.

As mentioned above, a prima facie case of obviousness requires that the prior art reference or references teaches or suggests all of the claimed limitations. See In re Royka, 490 F.2d 981, 180 U.S.P.Q. 580 (CCPA 1974); MPEP, Edition 8(e8), August 2001, Sections 2142, 2143.03. Accordingly, the claims of group 6 are patentable over Ishihara which does not teach or suggest the limitation of discoloring only one side of the filter.

Given the brute force approach of Ishihara discussed in detail in Sections 1-2, Ishihara appears to ablate the entire filter. Applicants note that Ishihara explicitly teaches destroying electrode 22 on the opposite side of filter 30. See Ishihara, column 4, lines 58-64. This is clearly an indication that Ishihara would ablate more than the substrate side of the filter because electrode 22 is on the opposite side of filter 22. See Ishihara, Figure 2. Therefore, Ishihara in fact teaches away from the invention of group 6.

As discussed above, teaching away from the claimed invention is strong evidence of non-obviousness. See U.S. v. Adams, 383 U.S. 39, 148 U.S.P.Q. 79 (1966); In re Royka, 490 F. 2d 981, 180 U.S.P.Q. 580 (CCPA 1974). Accordingly, the claims of Group 6 are patentable over Ishihara which teaches away from the invention as recited in the claims of Group 6.

CONCLUSION

In view of the foregoing, the Appellant submits that the claims are not properly rejected as being unpatentable under 35 U.S.C. § 103(a) under the cited reference. Accordingly, it is respectfully requested that the board reverse the claim rejections and indicate that a Notice of Allowance respecting all pending claims be issued.

Dated this 21st day of November, 2003

Respectfully submitted,

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APPENDIX - THE CLAIMS ON APPEAL

1. (Previously Presented) A method for repairing defects in a normally white liquid crystal display, the method comprising:

applying power to the liquid crystal display;

backlighting the liquid crystal display while power is applied;

locating a defective pixel in the liquid crystal display while power is applied;

focusing a laser on a portion of a color filter corresponding to the defective pixel; and

at least partially ablating the portion of the color filter corresponding to the defective pixel using the laser to discolor the color filter without damaging a glass substrate associated with the color filter.

2. (Original) The method of claim 1, wherein the step of locating further comprises locating electrically open pixels while applying power to the normally white liquid crystal display.

3. (Original) The method of claim 2, wherein the locating step comprises using a color vision system to locate the defective pixel.

4. (Original) The method of claim 1, wherein the step of ablating comprises using a controller to control the laser to ablate the portion of the color filter.

5. (Original) The method of claim 1, wherein the step of focusing further comprises focusing a laser having a wavelength in the visible range.

6. (Previously Presented) The method of claim 1, wherein the step of ablating further comprises darkening the portion of the color filter corresponding to the defective pixel, wherein the level of discoloration is set according to an original color of the defective pixel.

7. (Original) The method of claim 1, wherein the steps of locating, focusing and ablating are repeated for a plurality of defects on the liquid crystal display.

8. (Previously Presented) An apparatus for repairing defects in a normally white liquid crystal display (LCD), the apparatus comprising:

a backlight adapted to illuminate the LCD;

a power source adapted to provide power to the LCD such that non-defective pixels will block transmission of light through the LCD;

a vision system adapted to locate defective pixels while power is applied to the LCD;

a laser providing a laser light output;

a motion control system coupled to the laser and adapted to control motion of the laser; and

a controller adapted to control the laser to ablate a portion of the color filter corresponding to a location of each defective pixel of the defective pixels, wherein the color filter is discolored at the location of each defective pixel.

9. (Original) The apparatus of claim 8, wherein the laser has a wavelength in the visible range.

10. (Original) The apparatus of claim 8, wherein the vision system includes a camera equipped with automatic focus and automatic zoom that scans the LCD.

11. (Original) The apparatus of claim 8, wherein the laser includes a mask to block laser light from ablating portions of the color filter associated with non-defective pixels.

12. (Previously Presented) An apparatus for repairing defects in a normally white liquid crystal display (LCD), the apparatus comprising:

pixel defect location means for identifying a location of a defective pixel; and

ablation means for ablating a portion of a color filter corresponding to the location of the defective pixel, the ablation means discoloring the color filter at the location.

13. (Previously Presented) The apparatus of claim 12, wherein the means for locating uses electrically open pixels while applying power to the normally white liquid crystal display (LCD).

14. (Previously Presented) The apparatus of claim 13, wherein the means for locating uses a color vision system to locate the defective pixel.

15. (Previously Presented) The apparatus of claim 12, wherein the ablation means discolors the color filter at a different level for the color type of the defective pixel.

16. (Previously Presented) The apparatus of claim 12, wherein the ablation means only discolors a filter substrate side of the color filter.

17. (Previously Presented) The apparatus of claim 12, the ablation means darkens the portion of the color filter corresponding to the defective pixel.

18. (Previously Presented) The apparatus of claim 16, wherein the color filter is provided on a filter substrate, the filter substrate being closer to the ablation means than a TFT substrate of the LCD.

19. (Previously Presented) The apparatus of claim 12, wherein the ablation means does not damage a substrate of the color filter.

20. (Previously Presented) The apparatus of claim 12, wherein the pixel defect location means includes a camera equipped with automatic focus and automatic zoom that scans the LCD.